

PATENT SPECIFICATION

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DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements in or relating to Prosthesis Apparatus.

I, DAVID BELZIDSKY, a French citizen, of 31 rue Robert Lindet, Paris 15^e, France, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a device for use with prosthesis apparatus.

Amputated parts of which the missing member is replaced by prosthesis apparatus have been used for a long time with a knitted cap of wool or equivalent relatively coarse fibres as a means for protecting the stump.

Discomfort and even, sometimes, effects which are difficult to endure e.g. inflammation and abrasions, may result from the rubbing of the cap on the skin as a result of the action of the prosthesis apparatus, but these have been considerably reduced owing to the interposition of a thin sheath of knitted synthetic-resin yarn, between the mutilated member and the cap.

Such a sheath is disclosed in United Kingdom Patent Specification No. 826,041. An object of such a sheath is to permit rubbing action between the cap and the sheath, but to prevent all relative displacement with respect to the skin.

It has become apparant, in practice, that the efficacy of the sheath increases with improvement in the constancy with which it is held in position without sliding or creasing.

The large number of available prosthesis apparatus gives rise to difficulties since they differ in size, in their basic design, and in their detailed construction. It has been found that it would be of value, under certain conditions, to be able to provide a universal device, that is capable of maintaining the desired tension on the sheath and which can nevertheless be controlled at will. This device should be capable of use with any form

of prosthesis apparatus, at least for a given mutilated member. It should ensure the absence of slackening of the sheath under all circumstances of use of the apparatus, which implies that it must itself be mounted on the apparatus in such a manner that it cannot slide relative to the apparatus. However, it should at the same time allow the free movement which is necessary for an artificial limb between a sitting position and a standing position in the region where it is connected to the stump by means of a leather bandage.

According to the present invention there is provided a device for securing flexible protective material between the stump of a limb and prosthesis apparatus connected thereto, comprising an adjustable elongate flexible member capable of being secured about the prosthesis apparatus, and means carried on the external surface of the member for fastening thereto the said protective material.

Further according to the present invention there is provided a device for securing a layer of knitted synthetic-resin material in direct contact with the stump of an amputated limb and securing a layer of knitted relatively coarse wool material between said synthetic-resin layer and a hollow formed in one end of a prosthesis apparatus, said device comprising a strap of flexible material adapted to be secured around the exterior of the prosthesis apparatus, said strap including two parts each in the form of a right trapezium, a strip of elastic material interconnecting the said parts along their inclined edges, a pair of tabs extending from the free end of one of said parts, a piece of hooked synthetic-resin fibre fastening material on each of said tabs, complementary pieces of hooked synthetic-resin fibre fastening material at the free end of the other of said parts, said pieces and complementary pieces of fastening material being adapted to engage when the strap is positioned

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on the prosthesis apparatus, further pieces of hooked synthetic-resin fibre fastening material mounted on the external face of the strap and arranged in two spaced bands; pieces of hooked synthetic-resin fibre fastening material mounted adjacent the edge of the synthetic-resin material for fastening to one of the bands of said further pieces; and pieces of hooked synthetic-resin fibre fastening material mounted adjacent the edge of the wool material for fastening to the other of the bands of said further pieces.

Certain embodiments of a device in accordance with the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:—

Figure 1 is a view of the lower end of an amputated member, and in section of the upper end of a prosthesis apparatus on which there is secured a securing device in accordance with the invention;

Figure 2 is a view in section of a prosthesis apparatus likewise provided with a securing device in accordance with the invention;

Figure 3 is a view showing the internal surface of a securing strap in accordance with the invention; and

Figure 4 is a view showing the external face of the strap of Figure 3.

Figure 1 shows an embodiment of a securing device in accordance with the invention. On a stump 20 of an amputated member there is first of all provided a thin protective sheath 1 of knitted polyamide yarn placed directly in contact with the skin, and a thicker cap 21 of knitted relatively coarse wool, in contact externally with the prosthesis apparatus 9.

In order to maintain a controllable but constant tension on the sheath 1 and on the cap 21 after having placed the cap 21 over the upper extremity 9¹ of the apparatus 9, a strap 9a is secured about the apparatus 9 in the region of the extremity 9¹.

In the embodiment of Figure 1, the strap 9a carries several successive rows of buttons 8 at different levels. The sheath 1 and the cap 21 are provided, correspondingly, with several button-holes (not shown). It is possible, as can be seen in the left-hand part of Figure 1 to attach at a convenient height, the sheath 1 and the cap 21 to the strap 9a of the apparatus 9 whilst giving the sheath and cap the required tension. The buttons 8a of the strap are reserved for the sheath which is longer than the cap and buttons 8b, above the buttons 8a, for the cap. It should be noted that the attachment or fixing means (i.e. buttons 8 and cooperating button-holes) are rigid in part with the strap 9a and in part with the sheath and with the cap. It is possible to replace these attachment means by equivalent means, or by means such as garters secured only to the strap.

Figure 2 shows an embodiment in accordance with the invention in which the strap 9a is provided on its external surface with pieces 15 of fastening material termed "Velcro" (Registered Trade Mark) in the form of two circular bands at two different levels, as referred to before, one band for securing the sheath 1, the other band for securing the cap 21 as indicated by arrows. "Velcro" fastening material comprises a material base having a multiplicity of upstanding hooked fibres of nylon or other stiff synthetic-resin fibres. Two such materials cooperate by interaction of their upstanding fibres to form a secure fastening. Such a fastening is hereinbefore and hereinafter referred to as a hooked synthetic-resin fibre fastening.

The sheath 1 and the cap 21 are each provided at their external surface, which is capable, after being turned over, of coming into contact with the strap 9a, with pieces 14 of hooked synthetic-resin fibre fastening material complementary to the pieces 15. These pieces 14 are spaced apart and arranged in circular form at suitable levels. They are fixed to bands of elastic material 1¹ and 21¹ on which are provided, at their upper extremity, the sheath 1 and cap 21. This arrangement allows precise control of the tension of the latter members, the tension of which, after fastening the complementary pieces of the hooked synthetic-resin fibre material, is maintained constant.

In practice, the prosthesis apparatus is of conical shape and it is thus necessary to provide a strap or other elongate flexible member, which is easy to produce at low cost from geometrically-shaped parts of simple form, and which can be cut with a minimum of wastage of material. It is also desirable that the strap should be adaptable, without risk of sliding, to numerous types of prosthesis apparatus which are already in existence. Finally, it is desirable to take into account phenomena which are well known to occur with mutilated limbs, already hereinbefore discussed. In the vertical position, the stump is liable to swell within the prosthesis apparatus if the strap tightening, which has been effected in the sitting position, has been excessive in order to prevent sliding under the effect of the tension of the sheath and of the cap.

In order to meet simultaneously the difficulties briefly discussed hereinabove, the detailed construction of the strap must be considered.

Figures 3 and 4 show a preferred form of the strap in accordance with the invention, both Figures showing the same strap 9a, in its flat condition.

In Figure 3, the strap is seen from the internal face which will come into contact with the prosthesis apparatus.

Two parts of the strap 22 and 23 which are substantially identical, are made of flexible but nevertheless strong material, such as leather, and have the form of right trapeziums interconnected, at an angle α , by their inclined sides 22a, 23a, by a narrow strip of elastic material 24. The face visible in Figure 3, is intended to come in contact with the prosthesis apparatus and a roughened surface is provided in order to increase further its co-efficient of friction.

The part 22 is extended at its end 22b by two securing tabs of hooked synthetic-resin fibre material 25 of which the surface, has the same texture as that of the parts 14 (Figure 2) and is capable of covering, after closure of the strap about the apparatus, the external face of the end 23b of the band 23.

As can be seen in Figure 4, the external faces of the tabs 25 are covered with pieces of securing material "Velcro" 15 which can also be seen in Figure 2.

The narrow strip of elastic material 24, and the form of the parts 22 and 23, allow for a precise adaptation of the strap to the conical shape of the prosthesis apparatus; the two separate tabs 25 for closing the strap make it possible to provide a fit which is exactly matched to the different levels of the truncated cone; the fastening of the tabs 25 on the external surface of the end part 23b and of the roughened internal surface of the parts 22 and 23 ensure the absence of sliding of the strap on the apparatus, in spite of the tension applied to the sheath 1 and cap 21.

WHAT I CLAIM IS:—

1. A device for securing flexible protective material between the stump of a limb and prosthesis apparatus connected thereto, comprising an adjustable elongate flexible member capable of being secured about the prosthesis apparatus, and means carried on the external surface of the member for fastening thereto the said protective material.

2. A device according to claim 1, wherein the elongate flexible member comprises two parts each having substantially the same right trapezoidal form, the two parts being interconnected along their inclined edges to form an angle to one another such that after securing on the prosthesis apparatus, the two parts form substantially a truncated cone of which the upper face is a circle lying in a plane substantially perpendicular to the axis of the prosthesis apparatus.

3. A device according to claim 2, comprising a strip of elastic material interconnecting said trapezoidal parts.

4. A device according to claim 1, 2 or 3 wherein said fastening means is divided into two spaced parts.

5. A device according to claim 4, wherein said two parts are arranged in two bands,

one said part serving to hold one element of the protective material and the other said part serving to hold another element of the protective material.

6. A device according to claim 5, in which each of the said two parts is provided with a fastening material which cooperates with a complementary fastening material provided on said one element of protective material which takes the form of a sheath of synthetic-resin yarn material, and provided on said other element of protective material which takes the form of a cap of relatively coarse knitted woollen material.

7. A device according to claim 6, wherein said fastening material and said complementary fastening material are each of a hooked synthetic-resin fibre fastening material.

8. A device according to claim 2, comprising a pair of tabs at one end of the flexible member, a hooked synthetic-resin fibre fastening material on each said tab, and complementary hooked synthetic-resin fibre fastening material on the other end of the flexible member, the said fastening materials being arranged to engage one another when the flexible member is mounted on said prosthesis apparatus.

9. A device according to any one of the preceding claims wherein the internal surface of the flexible member is roughened.

10. A device for securing a layer of knitted synthetic-resin material in direct contact with the stump of an amputated limb and securing a layer of knitted relatively coarse wool material between said synthetic-resin layer and a hollow formed in one end of a prosthesis apparatus, said device comprising a strap of flexible material adapted to be secured around the exterior of the prosthesis apparatus, said strap including two parts each in the form of a right trapezium, a strip of elastic material interconnecting the said parts along their inclined edges, a pair of tabs extending from the free end of one of said parts, a piece of hooked synthetic-resin fibre fastening material on each of said tabs, complementary pieces of hooked synthetic-resin fibre fastening material at the free end of the other of said parts, said pieces and complementary pieces of fastening material being adapted to engage when the strap is positioned on the prosthesis apparatus, further pieces of hooked synthetic-resin fibre fastening material mounted on the external face of the strap and arranged in two spaced bands; pieces of hooked synthetic-resin fibre fastening material mounted adjacent the edge of the synthetic-resin material for fastening to one of the bands of said further pieces; and pieces of hooked synthetic-resin fibre fastening material mounted adjacent the edge of the

wool material for fastening to the other of the bands of said further pieces.

11. A device for use with a prosthesis apparatus substantially as hereinbefore described with reference to the accompanying drawings.

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Fig. 1

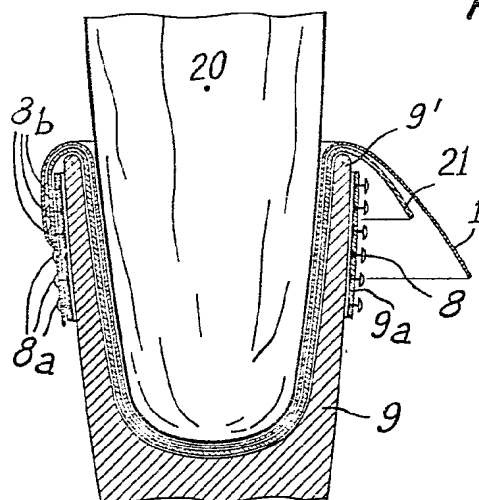
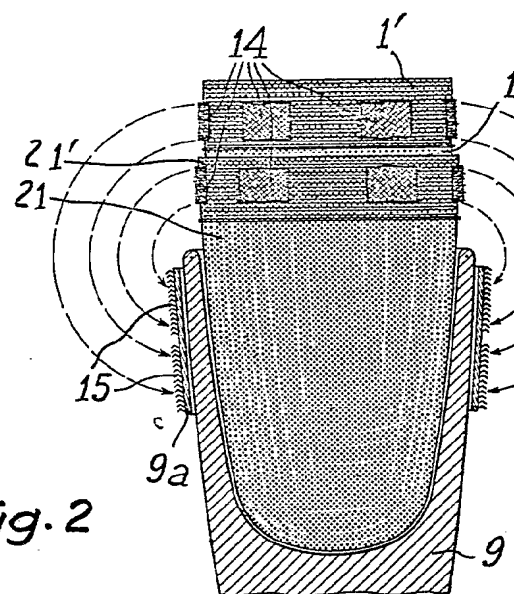


Fig. 2



g. 1

Fig. 3

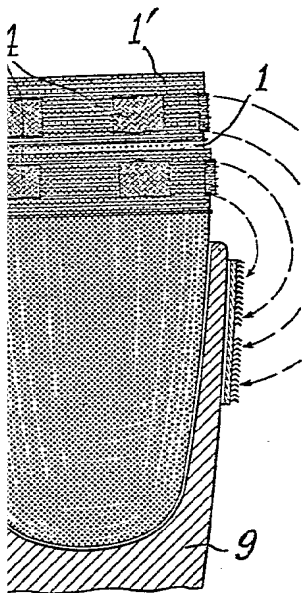
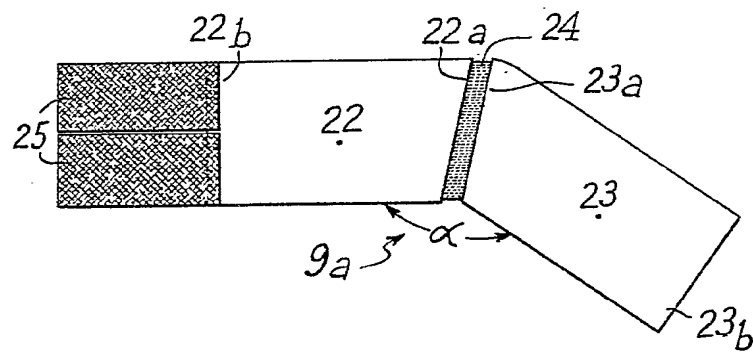


Fig. 4

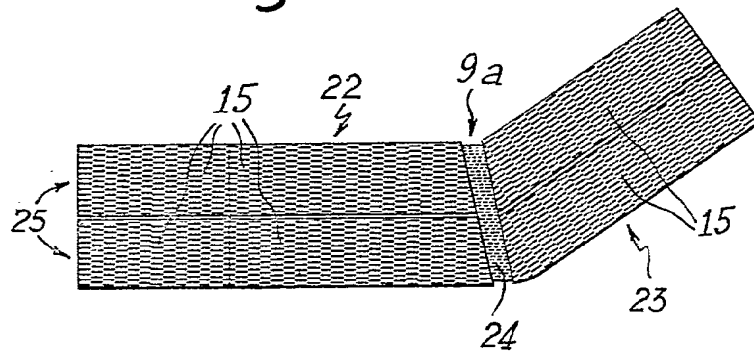


Fig. 1

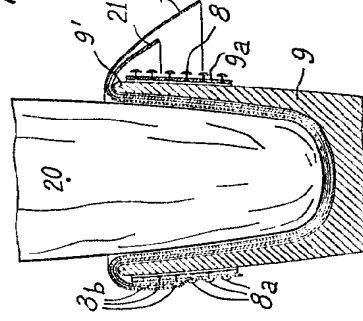


Fig. 3

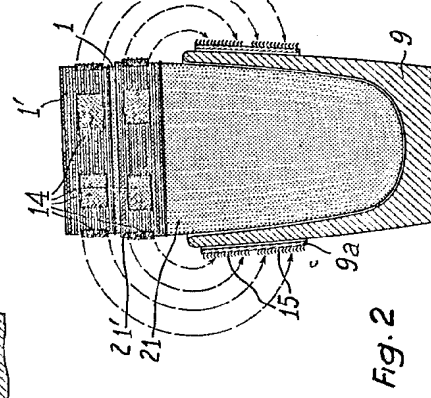
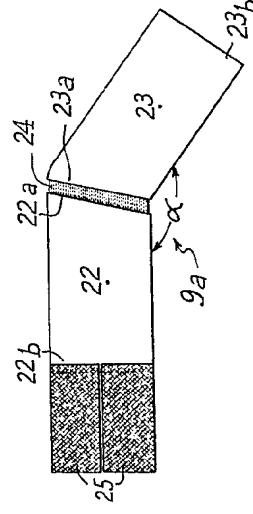


Fig. 2

Fig. 4

